

23. An ink jet apparatus comprising:  
a first ejecting portion for ejecting ink to a printing material;  
a second ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and  
control means for selectively driving said second ejecting portion.

24. An apparatus according to Claim 23, wherein said control means is manually operable.

25. An apparatus according to Claim 23, wherein said control means is responsive of a kind of the printing material.

26. An apparatus according to Claim 23, wherein the liquid has a smaller surface tension than the ink.

27. An apparatus according to Claim 23, wherein the liquid comprises a cation material of a low molecular weight component and a high molecular weight component, and the ink comprises anion dye.

28. An apparatus according to Claim 23, wherein the liquid comprises a cation material of a low molecular weight component and a high molecular weight component, and the ink comprises anion pigment.

29. An apparatus according to Claim 23, wherein said first ejecting portion and second ejecting portion have thermal energy generating means.

30. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and  
control means for controlling the amount of ejected liquid in accordance with an ambient condition, when the ink and the liquid are mixed or reacted on the printing material.

31. An apparatus according to Claim 30, wherein the ambient condition includes a temperature, and higher seeping property ink is used when the temperature is high.

32. An apparatus according to Claim 30, wherein the ambient condition includes temperature, and the amount of liquid decreases with an increase of the temperature.

33. An apparatus according to Claim 31, wherein the higher seeping property ink has a higher content of surfactant.

34. An ink jet printing apparatus comprising:  
an ink jet ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and  
control means for changing a kind of liquid in accordance with an ambient condition, when the ink and the liquid are mixed or reacted on the printing material, the kinds of liquids having different surface tension or seeping property.

35. An apparatus according to Claim 34, wherein the ambient condition includes an ambient humidity, and the amount of liquid decreases with a decrease of the humidity.

36. An apparatus according to Claim 34, wherein the ambient condition includes an ambient humidity, and higher seeping property ink is used when the humidity is low.

37. An apparatus according to Claim 34, wherein said control means uses different kinds of print quality improving liquid in accordance with the ambient condition.

38. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;

a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and

control means for changing a kind of liquid and for controlling the amount of liquid in accordance with an ambient condition, when the ink and the liquid are mixed or reacted on the printing material, the kinds of liquids having different surface tension or seeping property.

39. An apparatus according to Claim 38, wherein the ambient condition includes an ambient temperature, and the amount of liquid decreases with an increase of the temperature.

40. An apparatus according to Claim 38, wherein the ambient condition includes an ambient humidity, and the amount of liquid decreases with a decrease of the humidity.

41. An apparatus according to Claim 38, wherein the ambient condition includes temperature, and higher seeping property ink is used when the temperature is high.

42. An apparatus according to Claim 38, wherein the ambient condition includes an ambient humidity, and higher seeping property ink is used when the humidity is low.

43. An apparatus according to Claim 38, wherein said control means uses different kinds of liquids in accordance with the ambient condition.

44. An apparatus according to Claim 42, wherein said control means uses different kinds of liquids in accordance with the ambient condition.

45. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and  
control means for controlling the amount of liquid in accordance with a kind of the printing material, when the ink and the liquid are mixed or reacted on the printing material.

46. An apparatus according to Claim 45, wherein said control means increases the amount of the liquid per unit area with a decrease of a seeping property of the printing material.

47. An apparatus according to Claim 45, wherein said control means uses higher seeping property liquid when the seeping property of the printing material is low.

48. An apparatus according to Claim 45, wherein said control means uses kinds of liquid having different surface tension or seeping property in accordance with the kind of the printing material.

49. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and  
control means for changing a kind of liquid in accordance with a kind of the printing material, when the ink and the liquid are mixed or reacted on the printing material, the kinds of liquid having different surface tension or seeping property.

50. An apparatus according to Claim 49, wherein said control means uses higher seeping property liquid when the seeping property of the printing material is low.

51. An apparatus according to Claim 49, wherein said control means uses different kinds of liquids in accordance with the kind of the printing material.

52. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;

a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and

control means for changing the kind of liquid and for controlling the amount of the liquid, in accordance with the kind of the printing material, when the ink and the liquid are mixed or reacted on the printing material.

53. An apparatus according to Claim 52, wherein said control means increases the amount of the liquid per unit area with a decrease of the seeping property of the printing material.

54. An apparatus according to Claim 52, wherein said control means uses higher seeping property liquid when the seeping property of the printing material is low.

55. An apparatus according to Claim 52, wherein said control means uses kinds of liquid having different surface tension or seeping property in accordance with the kind of the printing material.

59. An ink jet printing apparatus comprising:  
an ink jet ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and

control means for ejecting the liquid to such an area on the printing material as is determined to correspond to a selected datum for ejection of the ink.

60. An apparatus according to Claim 59, wherein the selected datum is one for a character.

61. An apparatus according to Claim 59, wherein the selected datum can be changed.

62. An ink jet printing apparatus comprising:  
an ink ejecting portion for ejecting ink on a printing material;  
a liquid ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material; and

control means for ejecting the liquid to such an area on the printing material as is determined to correspond to a selected datum for ejection of the ink and to correspond to ejection of the ink of a predetermined color among a plurality of inks.

63. An apparatus according to Claim 62, wherein the predetermined color is black, and the selected datum is one for character.



64. An apparatus according to Claim 62, wherein the predetermined color is one selected from yellow, magenta and cyan, and the ink of other than the predetermined color is a black ink.

65. An apparatus according to Claim 62, wherein the predetermined color is selectable.

66. An apparatus according to Claim 62, wherein the selected datum is changeable.

67. An apparatus according to Claim 30, wherein said ink and liquid ejection portions have electromechanical transducers for ejecting the ink and the liquid.

68. An apparatus according to Claim 30, wherein said ink and liquid ejecting portions have electrothermal transducers for ejecting the ink and the liquid.

69. An apparatus according to Claim 30, wherein said ink and liquid ejecting portions have a combination of electrothermal transducers and electromechanical transducers for ejecting the ink and the liquid.

70. An apparatus according to Claim 30, wherein said liquid comprises a low molecular weight cation material and a high molecular weight cation material, and said ink comprises anion dye.

71. An apparatus according to Claim 30, wherein said liquid comprises a low molecular weight cation material and a high molecular weight cation material, and said ink comprises anion compound and pigment.

72. An apparatus according to Claim 30, wherein said liquid ejecting portion has a thermal energy converter to eject the liquid, and said ink ejecting portion has a thermal energy converter to eject the ink.

73. An apparatus according to Claim 30, wherein said ejecting portions are reciprocable.

74. An apparatus according to Claim 73, wherein said liquid ejecting portion and said ink ejection portions are arranged in a direction of reciprocation.

75. An apparatus according to Claim 74, wherein said ejecting portions each have an array of ejection outlets in a direction substantially perpendicular to the direction of the reciprocation.

76. A print produced using said apparatus as defined in Claim 30.

77. An ink jet recording method comprising the steps of:

recording on a printing material using a plurality of color inks;

performing one of the following three operations, which are selectable during printing:

coagulating, or causing to be insoluble, coloring material of the inks used in said recording step by ejecting a liquid, for coagulating or causing to be insoluble the coloring material of the inks used in the recording step, onto the printing material to the ink or inks used in said recording step, for the entire printing area of the printing material;

coagulating, or causing to be insoluble, the coloring material of the inks used in said recording step by ejecting the liquid onto the printing material to the ink or inks used in said recording step, mainly on a boundary between different inks on the printing material; and

abstaining from ejecting the liquid.

78. A method according to Claim 77, wherein said boundary is between a black color ink and a non-black color ink.

79. An ink jet recording method comprising the steps of:

recording on a printing material using chromatic ink containing coloring material;

mixing or reacting with the chromatic ink a substantially hypochromic or byaline liquid containing a component effective to coagulate or cause to be insoluble a component of the ink;

ejecting black ink with at least a black ink ejecting portion in said recording step; and

ejecting a substance containing at least the liquid with a liquid ejecting portion in said mixing or reacting step during one scan at a position prior to the black ink ejecting portion.

80. An ink jet recording method comprising the steps of:  
recording on a printing material using a plurality of color inks;  
performing one of the following three operations, which are selectable during printing:

coagulating or causing to be insoluble coloring materials of the inks used in said recording step by ejecting a liquid, for coagulating or causing to be insoluble the coloring material of the inks used in the recording step, onto the printing material to the ink or inks used in said recording step, for the entire printing area of the printing material;

coagulating or causing to be insoluble the coloring material of the inks used in said recording step by ejecting the liquid onto the printing material to the ink or inks used in said recording step, mainly on a boundary between different inks on the printing material; and

abstaining from ejecting the liquid,

wherein in said coagulating and causing steps the amount of ink ejection per unit area, for an area of the printing material where the liquid and the ink are superimposed, is larger than the amount of ink ejection per unit area for an area of the printing material where the liquid and the ink are not superimposed.

81. A method according to Claim 80, wherein said boundary is between a black color ink and a non-black color ink.

82. An ink jet recording method comprising the steps of:  
recording on a printing material using chromatic ink containing coloring material;

mixing or reacting with the chromatic ink a substantially hypochromic or byaline liquid containing a component effective to coagulate or cause to be insoluble a component of the ink;

ejecting black ink with at least a black ink ejecting portion in said recording step;

ejecting a substance containing at least the liquid with a liquid ejecting portion in said mixing or reacting step, wherein the liquid ejecting portion is disposed at an end in a main scan direction;

ejecting yellow, magenta and/or cyan inks with a chromatic ink ejecting portion in said recording step;

sequentially ejecting, in a printing mode wherein the liquid is mainly ejected at a boundary between the black ink and a non-black ink, a first color ink, a second color ink, a third color ink, and a fourth color ink in said recording step; and

disposing the liquid ejecting portion for ejection of the liquid prior to the ejecting portion for printing the second color ink.

83. A method according to Claim 82, wherein the first color ink is a yellow, magenta or cyan ink, and the second color ink is the black ink.

84. A method according to Claim 82, wherein the first color ink is the black ink, and the second color ink is the yellow, magenta or cyan ink.

85. A method according to Claim 77, wherein said ejecting portions have electrothermal transducers.

86. A method according to Claim 77, wherein said ejecting portions have electromechanical transducers.

87. A method according to Claim 77, wherein said liquid contains high molecular weight and low molecular weight cation materials, and the ink contains anion dye.

88. A method according to Claim 77, wherein said liquid contains high molecular weight and low molecular weight cation materials, and the ink contains anion dye, or contains anion material and pigment.

89. An ink jet recording apparatus comprising:

- recording means for recording on a printing material using a plurality of color inks;
- means for ejecting a liquid for coagulating or causing to be insoluble coloring material of the inks;
- means for performing the following operations:
  - ejecting the liquid for an entire printing area of the printing material,
  - ejecting the liquid mainly on a boundary between different inks on the printing material, and
  - abstaining from ejecting the liquid; and
- means for causing said performing means to switch between the two ejecting and abstaining operations during printing.

90. An apparatus according to Claim 89, wherein said boundary is between a black color ink and a non-black color ink.

91. An ink jet recording apparatus comprising:

means for recording on a printing material using chromatic ink containing coloring material; and

means for ejecting a liquid containing at least a substantially hypochromic or byaline liquid containing a component effective to coagulate or to cause to be insoluble a component of the ink by mixing or reacting with the ink,

wherein said recording means comprises at least a black ink ejecting portion for ejecting black ink, and

wherein during one scan, said ejecting means is positioned at a position prior to the black ink ejecting portion to eject the liquid.

92. An ink jet recording apparatus comprising:

recording means for recording on a printing material using a plurality of color inks;

means for ejecting a liquid for coagulating or causing to be insoluble coloring materials of the inks;

means for performing the following operations:

ejecting the liquid for an entire printing area of the printing material,

ejecting the liquid mainly on a boundary between different inks on the printing material, and

abstaining from ejecting the liquid; and

control means for operating such that when said performing means performs one of the ejecting operations, the amount of ink ejection per unit area for an area of the



printing material where the liquid and the ink are superimposed is larger than the amount of ink ejection per unit area for an area of the printing material where the liquid and the ink are not superimposed.

93. An apparatus according to Claim 92 , wherein said boundary is between a black color ink and a non-black color ink.

94. An ink jet recording method comprising the steps of:  
recording on a printing material using chromatic ink containing coloring material; and

ejecting a substance containing at least a substantially hypochromic or byaline liquid containing a component effective to coagulate or to cause to be insoluble a component of the ink by mixing or reacting with the ink with a liquid ejection portion of an ink jet recording apparatus,

wherein said recording step comprises the steps of ejecting black ink with at least a black ink ejecting portion of the ink jet recording apparatus, and ejecting yellow, magenta and/or cyan inks with chromatic ink ejecting portions of the ink jet recording apparatus,

wherein the liquid ejecting portion is disposed at an end in a main scan direction,

wherein, when the liquid is mainly ejected on a boundary between the black ink and a non-black ink, first color, second color, third color and fourth color inks are sequentially ejected, and

wherein when the liquid ejection portion ejects the liquid, the liquid ejection portion is disposed prior to the ejecting portion for printing the second color ink.

95. An apparatus according to Claim 94, wherein the first color ink is the yellow, magenta or cyan ink.

96. An apparatus according to Claim 94, wherein the first color ink is the black ink, and the second color ink is the yellow, magenta or cyan ink.

97. An apparatus according to Claim 89, wherein said ejecting portions have electrothermal transducers.

98. An apparatus according to Claim 89, wherein said ejecting portions have electromechanical transducers.

99. An apparatus according to Claim 89, wherein said liquid contains high molecular weight and low molecular weight cation materials, and the ink contains anion dye.

100. A method according to Claim 89, wherein said liquid contains high molecular weight and low molecular weight cation materials, and the ink contains anion dye, or contains anion material and pigment.

101. An ink jet apparatus comprising:

- a first ejecting portion for ejecting ink to a printing material;
- a second ejecting portion for ejecting liquid, for coagulating, or causing to be insoluble, coloring material of the ink, to the printing material;
- setting means for setting an operational mode of said second ejecting portion in accordance with an image datum; and
- driving means for driving said second ejecting portion in accordance with an output of said setting means.

102. An ink jet apparatus comprising:

- a first ejecting portion for ejecting ink to a printing material;
- a second ejecting portion for ejecting liquid, for coagulating or causing to be insoluble coloring material of the ink, to the printing material;
- setting means for setting an operational mode of said second ejecting portion in accordance with a condition during a printing operation; and
- driving means for driving said second ejecting portion in accordance with an output of said setting means.

B-1  
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Sub  
C1  
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103. (New) An ink jet recording apparatus comprising:

an ink ejection head for effecting image recording on a recording material

by ejecting ink;

a processing liquid ejection head for ejecting onto the recording material

processing liquid effective to insolubilize the ink; and

control means for controlling ejection of the processing liquid from said processing liquid ejection head depending on a kind of the recording material in use.

104. (New) An ink jet recording apparatus according to Claim 103,

wherein said control means prevents the ejection of the processing liquid from said processing liquid ejection head when the recording material in use is a coated paper.

105. (New) An ink jet recording apparatus according to Claim 103,

wherein said control means prevents the ejection of the processing liquid from said processing liquid ejection head when the recording material in use is an OHP sheet.

106. (New) An ink jet recording apparatus according to Claim 103,

wherein said control means prevents the ejection of the processing liquid from said processing liquid ejection head when the recording material in use comprises a base material and an ink reception layer thereon.

B1  
cont

107. (New) An ink jet recording apparatus according to Claim 103, wherein said control means permits the ejection of the processing liquid from said processing liquid ejection head when the recording material in use is plain paper.

108. (New) An ink jet recording apparatus comprising:  
an ink ejection head for effecting image recording on a recording material by ejecting ink;  
a processing liquid ejection head for ejecting onto the recording material processing liquid effective to insolubilize the ink; and  
control means for controlling ejection of the processing liquid from said processing liquid ejection head depending on a kind of the recording material in use,  
wherein said control means prevents the ejection of the processing liquid from said processing liquid ejection head when a test printing mode operation is carried out.

109. (New) An ink jet recording apparatus according to Claim 108, wherein the test printing mode operation is carried out in a printing-speed priority mode.

110. (New) An ink jet recording apparatus according to Claim 109, wherein in the printing-speed priority mode, skipped printing is carried out.

B7  
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C1  
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111. (New) An ink jet recording apparatus according to Claim 108,  
wherein an execution of said test printing mode operation is instructed from a host  
apparatus with which said recording apparatus is connected through an interface.

112. (New) An ink jet recording apparatus according to Claim 111,  
wherein the test printing mode operation is carried out in a printing-speed priority mode.

113. (New) An ink jet recording apparatus according to Claim 112,  
wherein in the printing-speed priority mode, skipped printing is carried out.

114. (New) An ink jet recording method comprising:  
a step of preparing an ink ejection head for effecting image recording on a  
recording material by ejecting ink;

a step of preparing a processing liquid ejection head for ejecting onto the  
recording material processing liquid effective to insolubilize the ink;

a step of providing the recording material on which the recording is  
effected; and

a step of controlling ejection of the processing liquid from the processing  
liquid ejection head depending on a kind of the recording material provided in said  
recording material providing step.

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C1  
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115. (New) An ink jet recording method according to Claim 114, wherein ejection of the processing liquid from the processing liquid ejection head is prevented in said controlling step when the recording material in use is a coated paper.

116. (New) An ink jet recording method according to Claim 114, wherein ejection of the processing liquid from the processing liquid ejection head is prevented in said controlling step when the recording material in use is an OHP sheet.

117. (New) An ink jet recording method according to Claim 114, wherein ejection of the processing liquid from the processing liquid ejection head is prevented in said controlling step when the recording material in use comprises a base material and an ink reception layer thereon.

118. (New) An ink jet recording method according to Claim 114, wherein ejection of the processing liquid from the processing liquid ejection head is permitted in said controlling step when the recording material in use is plain paper.

119. (New) An ink jet recording method according to Claim 114, wherein the processing liquid has a surface tension which is smaller than a surface tension of the ink.

B/Z  
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120. (New) An ink jet recording method according to Claim 114,

wherein the processing liquid comprises a cationic material of a low molecular weight component and a polymeric component, and the ink comprises anionic dye.

121. (New) An ink jet recording method according to Claim 114,

wherein the processing liquid comprises a cationic material of a low molecular weight component and a polymeric component, and the ink comprises an anionic dye compound and a pigment.

122. (New) An ink jet recording method comprising:

a step of preparing an ink ejection head for effecting image recording on a recording material by ejecting ink;

a step of preparing a processing liquid ejection head for ejecting onto the recording material processing liquid effective to insolubilize the ink; and

a step of controlling ejection of the processing liquid from the processing liquid ejection head depending on a kind of the recording material in use,

wherein ejection of the processing liquid from the processing liquid ejection head is prevented in said controlling step when a test printing mode operation is carried out.

123. (New) An ink jet recording method according to Claim 122,

wherein the test printing mode operation is carried out in a printing-speed priority mode.



*B1  
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C1  
Unit*

124. (New) An ink jet recording method according to Claim 123,  
wherein in the printing-speed priority mode, skipped printing is carried out.

125. (New) An ink jet recording method according to Claim 122,  
wherein execution of the test printing mode operation is instructed from a host apparatus  
with which a recording apparatus is connected through an interface.

126. (New) An ink jet recording method according to Claim 125,  
wherein the test printing mode operation is carried out in a printing-speed priority mode.

127. (New) An ink jet recording method according to Claim 126,  
wherein in the printing-speed priority mode, skipped printing is carried out.

128. (New) An ink jet recording method according to Claim 122,  
wherein the processing liquid has a surface tension which is smaller than a surface tension  
of the ink.

129. (New) An ink jet recording method according to Claim 122,  
wherein the processing liquid comprises a cationic material of a low molecular weight  
component and a polymeric component, and the ink comprises anionic dye.